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ABSTRACT

Six procedures for correcting oral reading errors were examined. Five learning disabled, junior high students served as subjects in the experiment, which consisted of five phases each lasting a minimum of seven days. Treatment effects were assessed on two word recognition measures one day after corrections were applied. Results indicated that some form of error correction tended to be significantly superior to no correction, but that many correction procedures used by teachers appeared to produce rather small effects on word recognition. One correction procedure which consisted of isolated word drill far exceeded the other corrections, and produced relatively high levels of word recognition. Results are discussed in terms of their implication for instructional practice. (Author)

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Technical Report No. 55

EVALUATING ERROR CORRECTION PROCEDURES FOR ORAL READING

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June 1978

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Evaluating Error Correction Procedures for Oral Reading

Instructional research in reading has principally centered upon the processes involved in word recognition. One reason for the focus on word recognition is that traditional analyses portray reading as a "bottom-up" process. According to this view, processing begins with letter features, which give rise to letter identification, which in turn lead to word recognition. Words are then recoded to inner speech from which the reader derives meaning, much the same as is done when listening to spoken language. From this viewpoint, it is easy to understand why instructional research on word recognition would be valued highly, since comprehension is taken to be a rather automatic outcome of accurate word recognition.

Recently, a number of psycholinguists and cognitive psychologists have challenged the "bottom-up" analysis of reading. They take the position that reading involves a significant amount of "top-down" processing in which the cognitive and language capabilities of the reader play a central role in the construction of meaning from text. Goodman (1967), for example, has described reading as a psycholinguistic guessing game in which readers form hypotheses about what the text says and merely use graphic information to support or disconfirm these hypotheses. Meaning is constructed from the head down rather than from the printed page up. Within this framework, instructional research that concentrates on recognition of single words may be only indirectly related to reading comprehension.

With respect to practice, exclusive adherence to either top-down or bottom-up viewpoints could lead to unsatisfactory outcomes for the novice

reader. For example, it is conceivable that a bottom-up approach to reading instruction might leave children with the strong impression that what counts in reading is getting the words right, and that comprehension or information gain is, at best, a secondary outcome. Children described as "word callers" appear to hold this conception of reading. On the other hand, it is conceivable that children taught totally from a top-down perspective may fail to develop an appreciation for printed words as a source of information. It may be that children who construct their own stories as they "read," inserting nonexistent words, phrases, and sentences, have overextended the guessing game interpretation of reading.

The ability to read for meaning is an unqualified goal of instruction, and it would be a mistake for teachers to overemphasize accurate word recognition at the expense of comprehension. Unlike Smith (1973), however, we believe that word recognition accuracy is a legitimate goal of reading instruction. The argument for de-emphasizing word recognition instruction is based largely on Goodman's (1969) accurate observation that even proficient readers make occasional word recognition miscues or errors. When miscues disrupt the construction of meaning, proficient readers are likely to reinspect the passage and correct the miscue. Conversely, if meaning construction is not disturbed, proficient readers may not correct the miscue, and, in fact, may not detect that a miscue has occurred at all. While agreeing that a disruption in meaning construction ought to serve as a prompt for re-examination of the text, it may be misleading to end the analysis there, for when proficient readers re-examine text, they do so with highly developed

word recognition skills. In short, although proficient readers do make reading miscues, they can succeed in correcting them when prompted to do so.

An entirely different set of circumstances prevails for children described as remedial readers. These students tend to differ from their normally progressing peers in two important respects: They are less able to construct appropriate meanings from text, and they are less able to read words accurately (Guthrie, 1973). Even for children making normal progress, it appears that development of decoding skill is gradual and continues far beyond the primary grades (Guthrie & Tyler, 1978).

Consider the situation of the remedial reading student who has made a reading miscue. In the first place, such students are probably less likely to detect a disruption in comprehension or meaning construction because they have learned to tolerate a good deal of ambiguity or anomaly in reading situations. In the second place, and more to the point, even if the students do detect a comprehension breakdown and are prompted to reinspect the text, they are less likely to succeed in correcting a miscue or in supplying a difficult word. Thus, even when reading for meaning, the remedial readers may be hampered in their attempts by word recognition failings.

The foregoing analysis of the situation confronting the remedial reader suggests at least two implications for instructional research on reading. First, one must find ways to help readers monitor disruptions in meaning construction and detect comprehension breakdowns (that is to make them metacomprehenders; Brown, in press). Second, one must discover effective means to allow readers to correct important miscues (that is to make them more proficient word recognizers). The present experiment

focuses upon the latter problem and represents an attempt to evaluate the effects of various error correction procedures on subsequent word recognition. The error correction procedures investigated were selected because the authors had observed various teachers using them, and because they are assumed to be among those most commonly employed by remedial reading teachers. Despite the apparent prevalence of these correction procedures, there is no previous research which directly evaluates their relative effectiveness.

One of the error correction procedures studied, Word Supply, was chosen because it dominates reading instruction at all levels. When listeners (teachers, parents, siblings) assume an instructional role, they nearly always respond to reading errors by first pointing out the error and then supplying the target word. The use of this or any other correction implies, among other things, that it will help the reader recognize the target word on future occasions. Indeed, the frequency with which teachers opt for the Word Supply correction suggests a belief that it has rather strong effects on learning. In the present study this assumption is tested by comparing the effects of Word Supply with no correction.

The other correction procedures examined were designed to build on the Word Supply correction to augment its effectiveness. For example, under a Sentence Repeat correction, the reader was supplied with the target word and was then required to reread the sentence containing the word, thus allowing the student to read the target word correctly in context, as well as providing a second repetition of the word. In another correction procedure, End of Page Review, the reader was supplied the target word at the time of error, and later that word, along with other target words, was

reviewed after the reader completed the page. This procedure provided delayed repetition of the target words and was thus less strongly prompted than the Sentence Repeat Correction, where the recent supply of the target word might assist the reader to recover the word from acoustic memory. Other correction procedures examined included Word Meaning and Drill.

Before describing the present study, there is a need to comment briefly on the choice of research strategy, since the one used falls outside the mainstream of reading research designs. First of all, the research was conducted in a natural, non-laboratory setting using the students' normal reading material. Secondly, it was designed to be a hybrid between a clinical case study and the more typical group experimental investigation. As such, the research possesses some of the advantages and liabilities of both types of investigations. The major advantage of clinical studies is that they yield a large amount of information about an individual student over an extended period of time. A major disadvantage of clinical studies is that they tend to be conducted with few students which raises questions as to the generalizability of findings to other individuals. Additionally, clinical researchers sometimes encounter difficulties in the statistical analyses of their data. Most statistics used in educational and psychological research were developed for group data; while statistical analyses for the single case are beginning to be developed, they are presently less well refined. Finally, since clinical studies are usually conducted with only one or two individuals who receive but a single treatment, they lack a relevant control or comparison "group" who receive a different treatment.

Experimental reading studies employing group designs enjoy certain advantages over the typical clinical study. With more students, control groups can be formed, thereby allowing for comparisons between treatments. Moreover, the addition of students raises confidence that the findings are generalizable to a larger population. Finally, conventional statistical analyses are readily available. On the other hand, certain problems arise in conducting group experimental studies, especially in the natural setting. In order to obtain a large number of participants, the experimenter often must make procedural sacrifices (e.g., the duration of treatments is often brief, sometimes only a few minutes, and few, (often only one), observations are obtained per student). In addition, it is rare for experimental studies in reading to apply several treatments to a single individual. Thus, the researcher is limited to observing an individual's performance under a single treatment condition and findings are stated with respect to the average group performance rather than with regard to an individual's performance or the percentage of individuals affected by the treatment.

The present study employed five students (a number considered healthy for a clinical study, but somewhat impoverished for a group experimental study). Each student received each experimental condition, thereby permitting a comparison of various treatment effects on individual students. Moreover, each student was observed a minimum of seven separate occasions under each condition. The study was conducted in a natural setting and employed the same instructional materials that students had used for the first half of the school year.

Method

Subjects and Setting

Five junior high school students (four boys and one girl) participated. All had been classified learning disabled by the local school district. Four students were thirteen years old, and one student was fourteen years old. The students had been placed in a basal reading series (Economy, 1976), with book placement ranging in level form 3.1 to 4.1. These placements were from four to five-and-one-half years below the students' grade level. All students came to the special education resource room daily for 50-minute periods that were devoted primarily to reading instruction. Each student was accustomed to receiving the individual attention of a special education teacher for at least one half of the period. The experimenters in the study were two special education teachers who had been working with these children throughout the year.

Treatments

The treatments were various error correction procedures contingently applied to oral reading errors. In general, omissions, substitutions, and mispronunciations were considered errors. However, omitted or mispronounced noun determiners (e.g., the, this) were not considered errors, nor were the suffixes -ing, -ed, and -s. When a student (1) either hestitated five seconds, omitted, substituted, or mispronounced a word, and (2) failed to self-correct, the teacher pointed to the target word and asked "What word?" Errors, or target words, were defined as words which the student did not read within five seconds after this request. No time constraint was imposed if the student had begun to pronounce the word. Altogether six correction

procedures were examined, with each procedure applied for a minimum of seven days. Correction procedures are described below.

Word Supply (WS). This procedure served as the control throughout all phases of the study, and consisted of the teacher supplying the correct word after student error. The student was required to repeat the supplied word.

No Supply (NS). Errors were not corrected; after having attempted a word, the student was told to continue reading.

Sentence Repeat (SR). After an error, the teacher supplied the correct word, and the student repeated the word and completed the sentence. The student was then requested to reread the entire sentence. If in rereading the sentence the student again missed the word, the correction procedure was repeated except that the student was not required to reread the sentence a second time.

End of Page Review (EPR). After an error, the teacher implemented the Word Supply correction and then printed the word on a list. At the end of each page the teacher presented the list and had the student read each word which had been missed on that page. If the student missed a word while reading the list, the teacher applied the Word Supply correction.

Word Meaning (WM). For each error, the teacher first executed the Word Supply correction and then asked "What does this word mean?" If the student did not give an adequate meaning, the teacher furnished a brief definition or synonym and the student then repeated the word meaning. A pocket dictionary was used when necessary to determine appropriate synonyms. Oral reading then resumed, beginning with the corrected word. If the word was missed at this point, the entire correction procedure was repeated. At

the end of each page, the list of words missed on that page was presented and the student read each word, and gave the meaning for any word whose meaning had been furnished. For any word or meaning missed, the correction procedure was repeated.

Drill. As before, the teacher supplied the correct word for each error at the time of its occurrence. At the end of the oral reading session, she printed all error words on 5 cm x 7½ cm index cards, which she then presented individually to the student. As each word was correctly pronounced, it was removed from the deck. For each word the student missed, the teacher supplied the correct word, which the student repeated. The teacher then asked, "What word?" and the student read the word again. Each corrected word was placed in the back of the deck, to be presented again. This procedure continued until every word had been read correctly. The teacher next shuffled the deck and repeated the presentation procedure. Drill continued until the student had successfully completed the entire word deck without an error on two consecutive presentations.

Design

The experiment consisted of five phases each of which included an experimental and control correction procedure. Students served as their own controls so that one half of the errors made during a given session received an experimental correction procedure while the other half received a control correction procedure. Within any session, an appropriate experimental correction and the control correction were applied to errors in an alternating fashion. Throughout all phases of the study, the same correction,

Word Supply, served as the control procedure. This was done to control for potential shifts in word difficulty across days and across phases.

The five phases of the experiment followed a sequence in which Word Supply was compared in turn with: (1) No Correction; (2) Sentence Repeat; (3) End of Page Review; (4) Word Meaning; and (5) Drill.

Measures and Reliability

Two measures of word recognition were gathered on error words: an Isolated Word measure and a Word in Context measure. Both measures were taken one day after the correction procedures had been applied to the error words. In the Isolated Word measure, error words from the previous day were listed on a sheet of paper and the student was asked to read that list. The Word in Context measure was taken by opening the book to the pages on which errors had occurred, and requesting students to read the sentence containing the target words. The experimenter recorded the students' performance on the target words only. The Isolated Word measure always preceded the Context measure, and no feedback was given on either. Percent correct was recorded on both measures and on both experimental and control (WS) words. Altogether, students received four scores daily: one each for the Isolated Word and Context measures under experimental and control conditions. The order of testing experimental and control target words was alternated daily. No word recognition tests were given on days which followed an absence, a weekend, or a holiday.

Procedural reliability was assessed using a check list which detailed each aspect of the instructional procedure. Prior to beginning a new condition, teachers practiced the instructional procedure in a role-playing session until they achieved a 100% implementation score. Upon implementation of a new

condition, a second teacher observed the lesson to assess procedural reliability. Procedure reliability averaged 97.5 with a range of 80 to 100%.

Procedure

Daily reading sessions were conducted individually and lasted approximately 35 minutes. At the beginning of a session, the teacher administered the Isolated Word and Context measures, if the student had read on the previous day. After this, the student read orally from the basal, beginning at the point where reading had ended on the previous day. (However, poems were not included as experimental reading material.) When a student made an error, one of the two corrections was applied and the teacher printed the word on a list. Care was taken not to include words missed on previous days as target words on subsequent days and not to include the same word in more than one correction procedure. After the oral reading session was completed, students answered previously constructed oral and written comprehension questions covering the passage.

Results and Discussion

Table 1 shows the means and standard deviations for the Isolated Word and Word in Context measures for all phases of the experiment.

Insert Table 1 about here

A 2(Treatment: Experimental vs. Control) within 5(Phases) x 7(Days) repeated measures analysis of variance was performed on each dependent measure. On the Isolated Word measure there were significant effects for Phases [$F(4,16) = 7.47$, $p < .002$] and Treatment [$F(5,20) = 24.74$, $p < .001$].

No other main or interaction effects were significant. Similar outcomes were observed on the Word in Context measure, with significant effects only for Phases [$F(4,16) = 24.63$, $p < .001$] and Treatments [$F(5,20) = 18.81$, $p < .001$].

Inspection of the data (See Figure 1) suggests that the five experimental treatments varied in the extent to which they differed from the control condition. Tests for simple effects were undertaken to study this impression.

Insert Figure 1 about here

While the differences between No Correction and the Word Supply control did not approach statistical significance on the Isolated Word measure ($F < 1$), the difference on the Context measure favored Word Supply [$F(1,20) = 7.45$, $p < .05$]. Performance under the SR correction was superior to that under the control for both Isolated Word [$F(1,20) = 4.79$, $p < .05$] and Context [$F(1,20) = 5.79$, $p < .05$]. The EPR means were significantly higher than the control on Isolated Word [$F(1,20) = 6.05$, $p < .05$], but not on the Context measure [$F(1,20) = 3.77$, $p > .05$]. The WM means exceeded control means on both measures: Isolated Word [$F(1,20) = 13.69$, $p < .01$] and Context [$F(1,20) = 8.62$, $p < .01$]. The same was true for Drill [$F(1,20) = 98.52$, $p < .001$ and $F(1,20) = 68.43$, $p < .001$] on Isolated Words and Context, respectively.

In general, it appeared that attempts to augment the Word Supply were successful in producing superior word recognition. Although the differences between experimental and control corrections tended to reach statistical significance, some of the absolute differences were quite small. For example, percent correct differences between experimental and control corrections in

the first three phases ranged from 4 to 12 percent. While somewhat larger differences were observed with Word Meaning, the most striking effects occurred with Drill. Not only did Drill exceed the control by the largest amount (44% for Isolated Word and 36% for Context), but it also produced generally high levels of word recognition (77% for Isolated Word and 84% for Context). Word recognition level under the other procedures was less satisfactory, ranging from 36% to 58% on Isolated Word and from 35% to 67% on the Context measure.

In addition to the individual comparisons between experimental and control corrections, comparisons were also made among the various correction procedures. To this end, an analysis of difference-scores was conducted with each student's daily percent correct under the control correction subtracted from daily percent correct under the operating experimental correction. Mean differences were then computed for each phase and subjected to Neuman-Keuls contrasts. For the most part, the results of these contrasts are consistent with the impression created by Figure 1. On the Isolated Word measure, the difference between experimental and control during Drill was significantly larger ($p < .01$) than differences under any other correction phase. Word Meaning and Sentence Repeat were significantly different from No Correction ($p < .05$). A similar pattern of results was obtained on the Context Measure. Drill was again superior to all other corrections ($p < .01$). In addition, the means for the WM, EPR, and SR corrections were significantly higher than that for No Correction. Taken together, these contrasts suggest that the Drill surpasses all other corrections examined in the study. Further, it appears that little difference exists among the other corrections, with the exception that No Correction seems inferior to some form of correction.

Subsequent research employing a larger sample size would provide a more sensitive and powerful test of potential differences among the other correction procedures. Nevertheless, it is worth noting that except for Drill the absolute differences are not large among the effects of the other correction procedures. Thus, even though follow-up research with a larger sample size might detect statistically significant differences among the corrections, some question would remain as to the practical significance of those differences for classroom instruction. Indeed, it is somewhat remarkable that statistically significant effects were obtained in the present study given its limited sample size. This suggests that observed effects were highly reliable across students. Figure 2 which presents the mean performance of individual students across the five phases confirms this inference. Figure 2 was constructed by subtracting a student's mean performance under the control correction from that under the experimental correction during a given phase. A zero score indicates that a student's performance under the experimental and control corrections was identical. A negative score indicates that student performance was higher under the control correction, while a positive score indicates a difference favioring the experimental correction. This figure permits an inspection of the consistency with which a correction procedure was effective across students. For example, No Correction was con-

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Insert Figure 2 about here

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sistently but only slightly inferior to WS across students. With but one exception the SR, EPR, WM and Drill corrections produced higher word

recognition scores across all students than did WS. Relative to each other, the SR, EPR, and WM corrections tended not to produce consistent effects across students. In contrast, every student achieved his/her highest performance level with the Drill Correction.

In the present study, sequence and treatment effects are confounded since the order of treatments was the same for all students. It is thus possible that the particular sequence of treatments was responsible for all or some part of the findings. This competing hypothesis is implausible for two reasons. First, in addition to the five phases previuosly described, another phase was included. This sixth phase was a replication of the second phase, i.e., Sentence Repeat vs. Word Supply, and thus constituted a reversal condition. Four of the five students participated in this phase (the other student had left school). Performance in the reversal condition (SR-2) dropped back from the level observed in the preceding drill phase, and was highly similar to performance in the original phase (SR-1). While experimental-control mean differences in SR-1 were 9.17 for Isolated Word and 10.57 for Context, the differences in SR-2 were 7.41 and 10.47 for the Isolated Word and Context measures, respectively. The SR-2 means, in fact, lie closer to the SR-1 means than to the means from any other phase. This replication of the SR effects makes it less likely that effects were a function of treatment sequence.

The second reason for discounting a sequence interpretation is based on a subsequent study by Larson and Jenkins (Note 1). The Drill and Word Supply corrections were applied to 17 third through sixth grade Title I readers on separate days in a counterbalanced sequence. Again highly significant effects

were observed; the mean scores on the Isolated Word measure under Drill and Word Supply were 80.5% and 45.6% correct, respectively. These values compare quite favorably with those of the present study, i.e., 77% and 34% correct. This replication of the Drill phase with a larger sample of students of varying grade level adds support to the present findings. It also lessens the plausability of a sequence hypothesis, since in the second experiment the Drill phase was not preceded by any other treatment.

The present findings have a number of implications for reading instruction. The small effect produced by the Word Supply correction compared to No Correction suggests that the most commonly used correction technique does not have a powerful effect on subsequent word recognition.

The second implication for classroom practice relates to teachers' purposes in scheduling oral reading practice. If one purpose is to improve children's word recognition skills, then oral reading may need to be supplemented with systematic corrections. Of those corrections examined in the present study, Drill seemed to produce the largest improvement on word recognition measured one day later. Although the time required to implement this correction might at first seem impractical, records indicate that a student took an average of 6.53 minutes per day to reach criterion (two perfect trials in succession) during Drill. Since many remedial and special education teachers work either with individual children or with very small groups for thirty minute instructional sessions, they might reasonably be able to schedule seven to ten minutes for individual drill. During the past year the authors have successfully employed the Drill correction with several Learning Disabled children using parents, aides, peer- and cross-age tutors to deliver the instruction.

A third implication for classroom practice derives from the methodology of the present study. Classroom teachers who are interested in individualizing effective error corrections with particular students could informally "research" this question. For example, teachers could easily alternate correction procedures with an individual student, and test for their effects on the following day. In this manner teachers could identify the correction most effective for an individual student, and then subsequently utilize that procedure in the context of on-going programs.

Finally, as we suggested in the beginning of this paper, the value of word recognition research depends, in part, on one's conception of reading as primarily a top-down or bottom-up process. If there is any validity to the bottom-up view, then the present findings would seem relevant for reading instruction since the various correction procedures produced differential effects on word recognition. Conversely, if reading is primarily a top-down process, the present finding would appear to have less relevance for instruction. Even in a top-down process, however, word recognition skills are essential for confirmation or rejection of hypotheses about the author's intended meaning. Perhaps certain correction procedures examined in the present study would be compatable with top-down approaches, provided teachers were careful in selecting miscues for correction. For example, miscues which did not affect the author's intended message would certainly not be candidates for correction.

Epilogue: The State of Instructional Research in Reading

In recent years instructional research in reading has not been prolific, and what little research has been done has been conducted in such a way as to

yield little useful information. For example, of the sixteen articles published in Volume XIII of the Reading Research Quarterly (1977-78), not one was an empirical investigation of instructional variables. During that same period the Reading Research Quarterly reviewed thirty-six articles on the "Teaching of Reading" through grade eight. Of these, seventeen (less than half) could be categorized as research which manipulated instructional variables. Even a number of these latter investigations failed to employ appropriate control conditions and/or employed "instructional treatments" that lasted for several minutes or a few hours. It should be noted, however, that among 638 reports reviewed in the Quarterly's "summary of investigations related to reading" (July 1976 to June 1977), there were additional studies which would qualify as instructional research, which were listed under other category headings, e.g., vocabulary and word identification. Even including these studies in the count, it is clear that instructional research is conducted infrequently and poorly. This is an unfortunate circumstance which should be altered. There are classroom instructional variables worthy of examination (e.g., correction procedures and teaching formats), and careful investigation of such might yield information resulting in improved instructional practices.

Reference Note

1. Larson, K., & Jenkins, J. R. Effects of oral reading error corrections on word recognition and comprehension. Paper presented at the annual meeting of the Council for Exceptional Children, Kansas City, Missouri, May 1978.

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Table 1

Means and Standard Deviations[a] of Experimental and Control Treatments Over Five Phases for Isolated Word and Context Measures

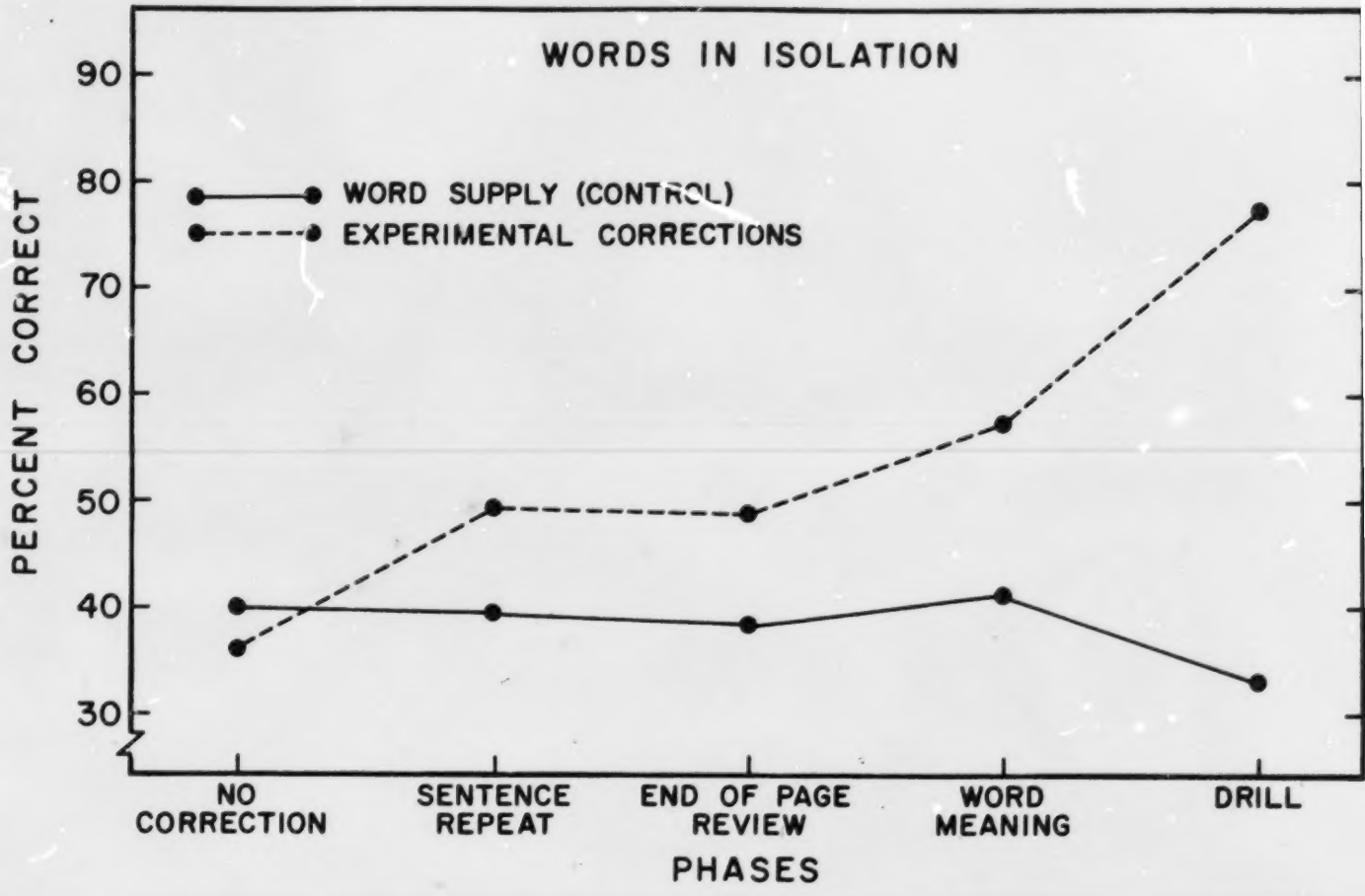
Correction	Phases				
	No Correction	Sentence Repeat	End of Page Review	Word Meaning	Drill
	Isolated words				
Experimental	36	49.1	49.0	57.5	77.4
	(10.8)	(10.9)	(12.5)	(12.9)	(9.0)
Control	40	39.4	38.1	41.1	33.4
	(12.0)	(2.8)	(14.8)	(16.1)	(9.7)
	Context				
Experimental	34.9	60.6	61.5	67.1	84.0
	(7.1)	(9.1)	(10.6)	(11.3)	(3.8)
Control	46.9	50.0	53.0	54.2	47.6
	(9.2)	(5.1)	(7.7)	(9.9)	(9.3)

[a]Numbers in parentheses are standard deviations.

Figure Captions

Figure 1. Percent correct word recognition in isolation and context as a function of a control and various experimental error correction procedures.

Figure 2. Experimental-Control differences in percent correct isolated word recognition for each student in each phase.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WORD SUPPLY (CONTROL)
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PERCENT CORRECT
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NO CORRECTION
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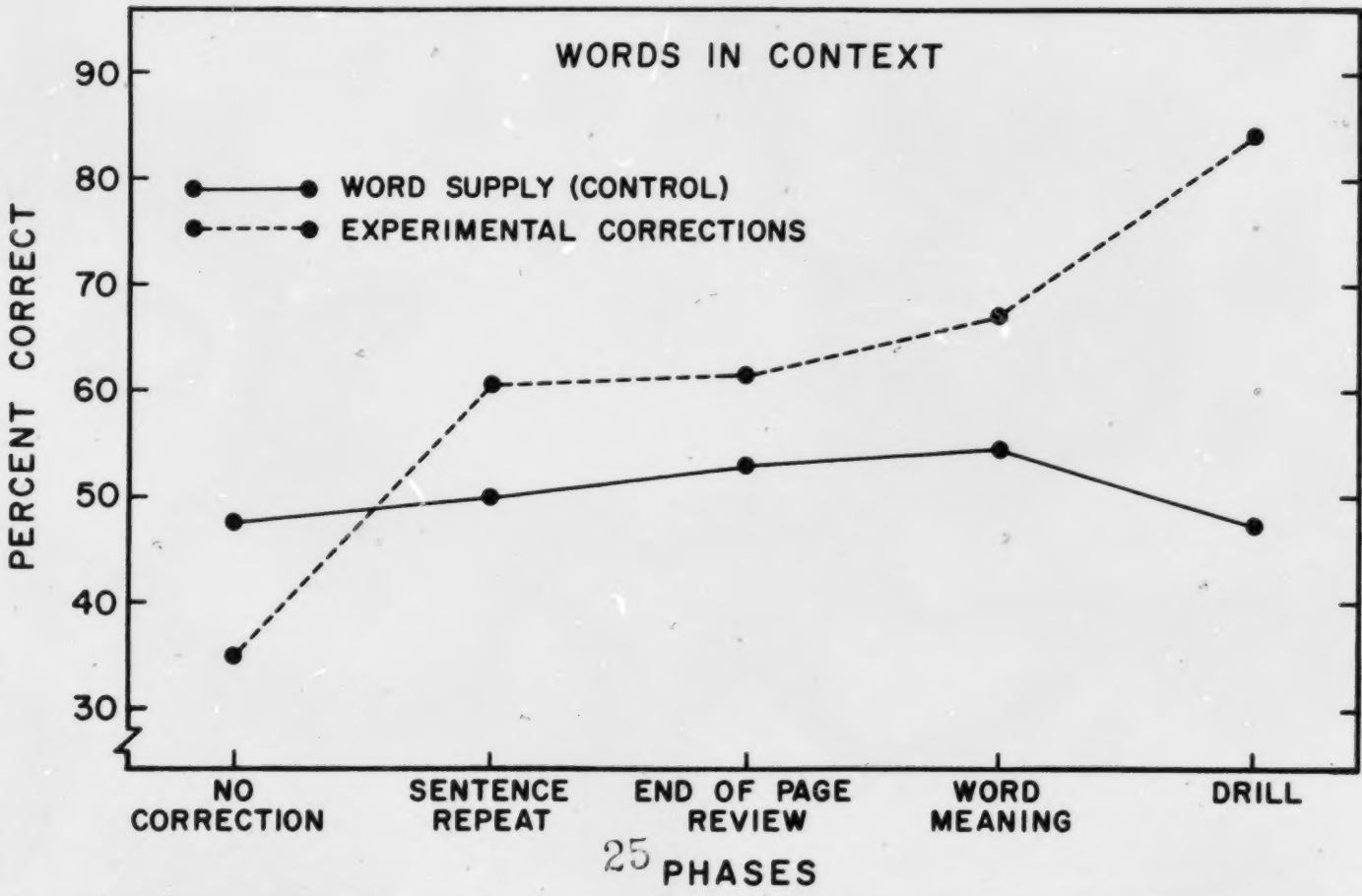
END OF PAGE REVIEW
WORD MEANING
DRILL
PHASES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PERCENT CORRECT
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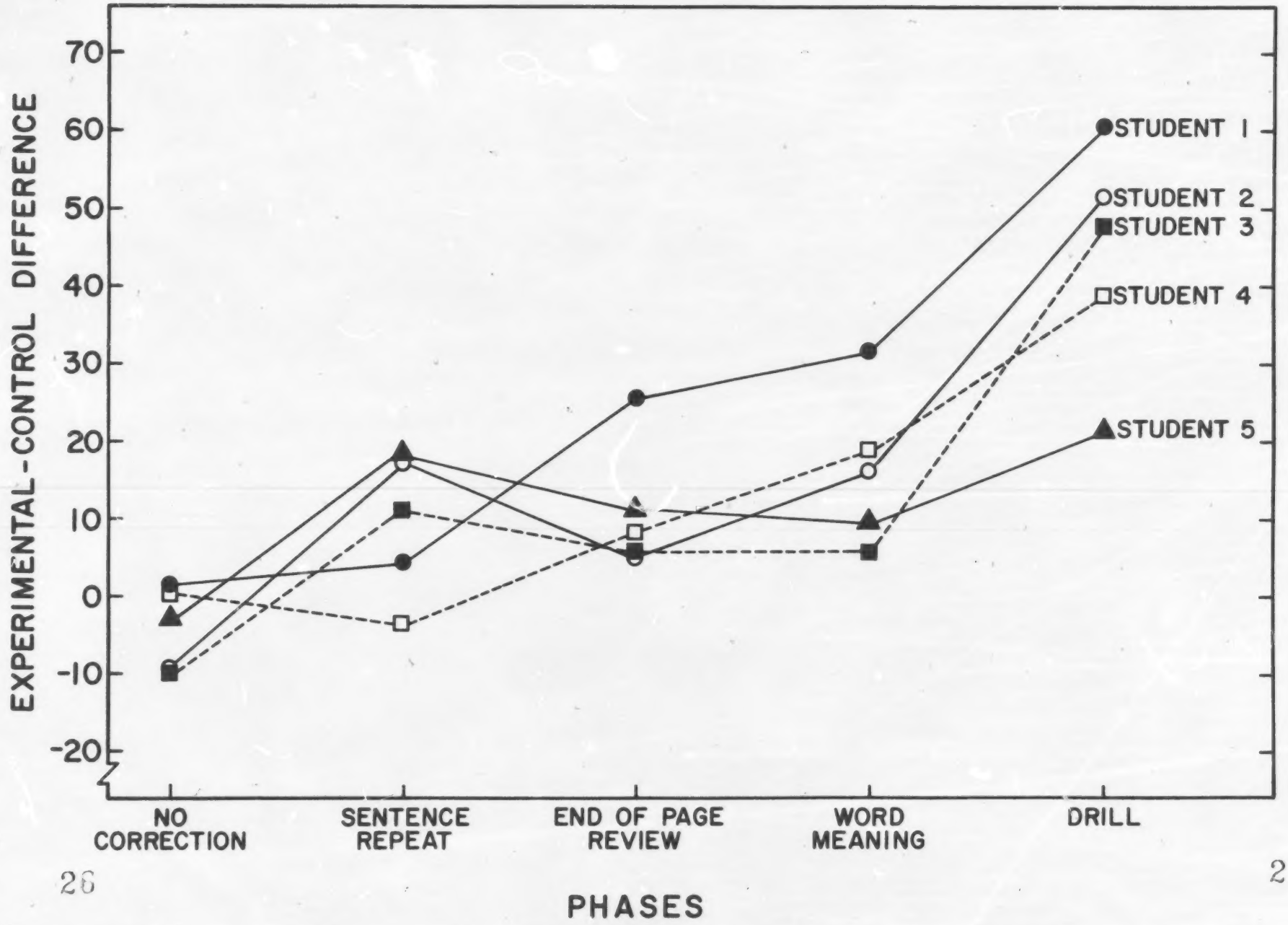
EXPERIMENTAL-CONTROL DIFFERENCE
70
60
50
40
30
20
10
0
-10
-20
STUDENT 1
STUDENT 2
STUDENT 3
STUDENT 4
STUDENT 5
NO CORRECTION
SENTENCE REPEAT
END OF PAGE REVIEW
WORD MEANING
DRILL
PHASES

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